

# Comision Federal de Eletricidad/Arizona Public Service Company of Phoenix (CFE/APS) Renewable Energy Mini Grid Project

**Location:** San Juanico, Baja California Sur (BCS) State

**Type:** Alternative energy generation

**Size:** 205 kW

**Funding:** Total: US\$1,040,000

Private: US\$530,600

Public: US\$509,400

**Objective:** To use a renewable-energy hybrid system to extend delivery service and reduce greenhouse gas (GHG) emissions.

**Duration:** 1998–2028 (mini grid is fully operational)

**Scale:** Rural

## Summary

In this project, two United States (US) electric utilities worked with the Mexican national utility CFE to replace a 205-kW diesel generator in San Juanico, Mexico, a small village not connected to the power grid. The hybrid system, which uses solar, wind, and diesel capacity, extends electrical service availability from the current 3 to 4 hours per day to 24 hours per day. It has improved the economic well-being and quality of life in this rural village, using technologies that keep GHG emissions to a minimum. The BCS State government plans to use this model to electrify several coastal villages over the next several years.

## In-Country Principles That Attracted Nondonor Financing

- Capacity building and informed decision making
- Institution building and access to justice and enforcement of laws



Private-sector interest was facilitated by the ability of utilities to operate under standard commercial practices, as evidenced by the hiring and developing of staff with appropriate skills matched to the job. Also important were the increased awareness, knowledge, and skills of sector professionals in technical areas, made possible, in part, by stakeholder partnerships and exchanges and dissemination of best practices.

Technical assistance, where development partners worked with Mexican nationals to invent and design solutions for local implementation also helped attract private-sector financing. The commercialization and development of existing utilities and a legal and regulatory system that covers tariffs also helped attract private-sector interest.

## Financing

Total project investment was roughly US\$1,040,000 (US\$135,000 for project development and US\$905,000 for implementation). Of the total, more than half (US\$530,600) came from two private US utility companies, APS and Niagara Mohawk Power Corporation (NMPC). The government of BCS State contributed US\$222,750, and CFE contributed US\$37,100. The US Agency for International Development (USAID) and the US Department of Energy (USDOE) contributed a total of US\$249,480.

The local community formed an electrification committee (patronato) and agreed to a tariff structure that makes the project sustainable by generating revenues sufficient to cover labor and expenses for system operation, fuel, equipment maintenance and minor repair, and replacement of consumables.

## The Project

The project site is a surfing destination and fishing village of 400 people in the BCS State that is 30 km from the nearest power grid. Villagers depended on a 205-kW diesel generator for their energy needs, which, because of high fuel costs, is operated for only 3 to 5 hours per day.

The APS/CFE Mini Grid Project developed solar, wind, and diesel capacity to displace the use of the diesel generator. The diesel component operates when solar and wind resources are below set levels and the battery banks are fully discharged. Under those conditions, the diesel generator provides power to the grid, with any excess power recharging the

batteries. Diesel consumption is estimated at roughly 90 L of fuel per day, compared with the previous 410 L per day.

The mini grid gives the community power 24 hours per day, allowing for the preservation of the daily fishing catch, improved food storage in residents' homes, longer school hours, and strengthened local public institutions. Economic benefits include providing power for the previously nonoperational fish processing facility and promoting tourism through the creation of a more reliable infrastructure.

Environmental benefits include reduced sulfur dioxide (SO<sub>2</sub>), GHG, and particulate emissions from the combustion of fossil fuels. Minimal clearing of vegetation and soil movement was required, and noise and visual pollution from the wind component of the project have been minimal. The potential for spills of hazardous materials is mitigated through spill response and battery recycling procedures.

The project supports the following goals of the CFE: to apply renewable energy technologies for electrifying remote villages; to operate a hybrid power system as a sustainable business; to contribute to environmental, economic, and social development in rural villages; and to develop a project that can serve as a model for similar projects in Mexico. The project also gives CFE the opportunity to gain detailed technical knowledge of hybrid power systems and the development and implementation of projects of this type.

## Technical Data

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The system consists of 10 Bergey 7.5-kW turbines on 37-m guyed-lattice towers, a 17-kW photovoltaic (PV) array, a 420-kWh 240-VDC battery bank, a 90-kW inverter, and a new, more efficient, 120-kW diesel generator.

## Performance Data

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Project GHG emissions are expected to be reduced from 405 tons of carbon dioxide (CO<sub>2</sub>) per year to 89 tons per year, or by 9,480 tons over the life of the project.

## Participants and Roles

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APS designed the plant and CFE built it. The patronato will operate the plant with support from CFE. The USDOE's National Energy Renewable Laboratory (NREL) will monitor plant performance. NMPC, USDOE, USAID, and the governments of San Jaunico, the municipality of Comondu, and the BCS State provided financing support.

The project was conducted under the auspices of the US Initiative on Joint Implementation (USIJI). Initiated in



1993 as part of the US Climate Change Action Plan, the USIJI supports the development and implementation of voluntary projects between the US and non-US partners that reduce, avoid, or sequester GHG emissions.

## Partner Contacts

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